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(54) COMPOSITION BASED ON REINFORCED POLYAMIDES

The invention concerns a composition based on a polyamide reinforced with glass fibers, lubricated internally and externally, used to produce, by injection, parts in mechanical subassemblies subject to high mechanical stresses.

Polyamide compositions reinforced with glass fibers lubricated only internally with calcium stearate or lubricated only internally with silicone are known.

The principal disadvantages of the known solutions are:

In the case of materials lubricated only externally, pronounced nonhomogeneity of the velocity fields in the melt-flow front are observed, leading to different contraction levels in different directions.

In the case of materials lubricated only internally, sluggish flow of the material from the injection machine and poor mold release of the parts from the die are observed. Moreover, reduced productivity is obtained in equipment used for mixing polyamide melts with the glass fibers. Moreover, the materials lubricated only internally exhibit poor quality of the surface of the injected parts.

The purpose of the invention is to prepare synergistic compositions based on internally and externally lubricated reinforced polyamides possessing a uniform distribution of glass fibers.

The problem resolved by the invention is the finding of new associations between components to reach the objective.

The composition according to the invention eliminates the mentioned disadvantages in that it consists of 64-65 wt% of a polyamide based on polycaprolactam or based on adipic acid and hexamethylenediamine, 0.2-15 wt% of an internal lubricant, chosen from graphite,

molybdenum disulfide, polytetrafluoroethylene, and liquid polysiloxane, 0.2-5 wt% of an external lubricant represented by zinc stearate or calcium stearate, and 10-40 wt% of glass fibers.

Four examples of the invention are provided below.

Example 1. 64 kg of a polyamide based on polycaprolactam with a density of 1.12 g/cm^3 and a relative viscosity in H_2SO_4 of 2.65 g/min are metered by weighing.

1 kg of zinc stearate and 3 kg of molybdenum disulfide are mixed for 5 to 10 minutes in a paddle mixer.

A granulator extruder with an intense mixing zone is charged with the mixture so produced and mixing is continued by rotation and translation of the screw.

In the transition zone to the molten state, 30 kg of glass fibers are introduced into the extruder as such or cut.

The composition is extruded into filaments with the following parameters through a nozzle with 3-mm holes.

– temperature of mixing zone	240-275°C
– temperature of pump cylinder	260-270°C
– nozzle temperature	280-295°C
– speed of mixing screw	120-145 rpm
– speed of pump screw	65-85 rpm

The filaments so extruded are cooled in a water bath and granulated on a granulator, whereupon they are dried in a hot-air dryer.

The granules obtained according to the aforementioned can be used to produce, by injection, parts for the automotive industry, agricultural vehicles and machines, as well as for the electrotechnical industry.

Example 2. A mixture of 47 kg of a polyamide based on polycaprolactam, 2 kg of zinc stearate, 1 kg of carbon black, and 15 kg of polytetrafluoroethylene are metered by weighing.

The mixture is agitated as in Example 1 and 35 kg of glass fibers are added as in Example 1.

The composition is extruded into filaments whose parameters are as in Example 1, whereas the filaments are granulated and dried by the same procedure.

Example 3. The following composition is metered and mixed as in Example 1: 64 kg of a polyamide based on adipic acid and hexamethylenediamine, 1.5 kg of zinc stearate, and 4.5 kg of graphite. The mixture so obtained is agitated in the melt as in Example 1 at a 10°C higher temperature and at the same speed.

30 kg of glass fibers are added and the filaments are extruded by the same method as in Example 1, from which granules are obtained by cutting and drying.

The granules so obtained can be used to produce, by injection, parts that are subject during operation to increased stress and which require self-lubrication (bearings, parts of submersible pumps, pinions, etc.).

Example 4. The following composition is metered and agitated as in Example 1: 60 kg of a polyamide based on adipic acid and hexamethylenediamine, 2 kg of silicone, and 13 kg of polytetrafluoroethylene. The mixture obtained is fed to an extruder with a mixing zone as in Example 1 and 25 kg of glass fibers are added to the melt transition zone.

The composition is extruded into filaments that are cooled, cut, and dried.

The granules so obtained can be used to obtain, by injection, parts for the aeronautical industry, construction and automotive industry, and the electrotechnical industry.

The composition according to the invention has advantages due to the fact that parts resistant to mechanical stress can be obtained based on it.

CLAIM

Composition based on a polyamide reinforced with glass fibers and intended to produce parts that are resistant to mechanical stress, characterized by the fact that it consists of 64-65 wt% of a polyamide based on polycaprolactam or based on adipic acid and hexamethylenediamine, 0.2-15 wt% of internal lubricants chosen from graphite, molybdenum disulfide, polytetrafluoroethylene, and liquid polysiloxane, 0.2-5 wt% of external lubricants represented by zinc stearate or calcium stearate, and 10-40 wt% of glass fibers.

(56) References

U.S. Patent No. 3,304,282

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